ITEM No. 22
FILE No. XVIII—1

COPY No. 75

~~CONFIDENTIAL~~

CHEMICAL INSTALLATIONS IN THE COLOGNE AREA

~~CONFIDENTIAL~~

COMBINED INTELLIGENCE OBJECTIVES
SUB-COMMITTEE

~~CONFIDENTIAL~~ C8J

REPORT ON VISIT TO VARIOUS CHEMICAL INSTALLATIONS IN THE COLOGNE AREA

9 - 11 March, 1945

Reported by

PAUL V. SEYDEL,
Captain
Chemical Warfare Service
Headquarters
ETOUSA

26 March, 1945.

CIOS Black List Item - 22
Miscellaneous Chemicals

COMBINED INTELLIGENCE OBJECTIVES
SUB-COMMITTEE
G-2 DIVISION, SHAEF (Rear), APO 413

~~CONFIDENTIAL~~ C.I.O.S.

TABLE OF CONTENTS

PERSONNEL OF INSPECTION TEAM

Captain Paul V. Seydel, CWS, Hq. ETOUSA
Captain J. C. Seemiller, CWS, EEIST No.2, Hq.First Army

~~CONFIDENTIAL~~ C J S CSJ

REPORT ON VISIT TO VARIOUS CHEMICAL INSTALLATIONS IN THE COLOGNE AREA.

During the period immediately after the fall of Cologne, several chemical plants and offices in the area were investigated for the purpose of obtaining basic information on the materials being manufactured. The information obtained in each of the plants visited is given in this report.

I. Report on Visit to Deutsche Gold- Und Silberscheideanstalt Werk Knapsack, Knapsack, Germany.

Location of Plant: Coordinates 373519, on Sheet 5107, G.S.G.S.4414.

This plant was visited on 9 March, 1945, by Captain Paul Seydel, CWS, Hq. ETOUSA, and Captain Joseph Seemiller, CWS, EEIST No.2. Two later visits were made by Captain Seydel, to search the files and records. Only one employee, Michael Kirsch, a welder who had worked there for fifteen years, could be found on the grounds. This man, however, was quite well informed, and knew a good deal, not only about what was done in his plant, but had general information on other plants in the neighbourhood. He informed the visiting officers that the director of the plant had gone across the Rhine, as well as many of the employees.

The principal products produced by this plant were chlorine and metallic sodium. Some chloride of lime and some heat-treating salt mixtures were also produced. Raw salt was purchased by this plant, which had facilities for purifying the salt.

No chlorine was found on hand, despite intelligence reports of varying amounts, up to 80,000 tons, and reports of underground storage facilities (two underground tanks exist, which were used for the storage of petroleum oils for fuel). Approximately 35 tons of sodium metal were found, packaged in steel drums containing 130 kg. per package. Small quantities of bleach and of heat-treating salts were found in the storage locations.

The plant was damaged somewhat, but not very seriously, in the raid of 28 October, 1944. Serious damage was done to the neighbouring plant of AG für Stickstoffdünger Fabrik. The damage was principally to water cooling equipment and to the buildings - the actual production machinery was not badly affected. Chlorine storage facilities and plant machinery suffered no damage, neither did the cell room.

However, subsequent to this raid, it was decided to dismantle at least half the plant for shipment and reinstallation on the other side of the Rhine. Kirsch did not know where

the plant was to be set up. The decision was probably made by the Government, since it was found later that several other plants in the neighbourhood, including Glanzstoff-Courtaulds, had received orders to move equipment across the Rhine. Some of the apparatus had already been moved, including part of the chlorine handling equipment, and some converters. A complete inventory was not made, but evidently not more than half of any of the types of equipment had been transferred. The salt purification plant was still intact.

All the electrolytic cells had been dismantled. Some of the machinery and pipe-lines had been damaged, requiring a certain amount of repair work, and practically all the iron machinery including principally the chlorine handling equipment, was badly rusted. It was estimated that under fairly good conditions, at least several weeks to two months would be required to put the plant back in running condition at half capacity. For full capacity, replacement of some of the machinery which had been shipped away would be necessary.

The laboratory, where work was done on process development, had suffered a direct bomb hit. Practically all the laboratory equipment had either been destroyed or transferred.

Power was furnished from the nearby Rheinische Westfälische Elektrizitätswerke, at 6,000 volts, alternating current. Rotary convertors were used for conversion. Mercury convertors were also present. Kirsch said that these had been tried, but their efficiency was much too low.

In the absence of any of the management personnel for questioning, some of the files and documents were confiscated. These included cost records of products, several chlorine files, shipping records, ground plan of plant and a file with general information on the plant. These documents were submitted for file with MIRS.

Salt Purification.

All of the salt used was purified in the plant. Continuous evaporators were used, and the wet salt dried first in centrifuges, then in a rotary drier. The cost of purified salt in the month of July, 1944 was 4.32 RM per hundred kilos.

Electrolysis.

Electrolysis was carried out in cells equipped to carry from 17,000 to 32,000 amperes. The cells were of the Downs type. Graphite for electrodes was formerly imported from America, but recently the plant had been using graphite of German origin. The electrodes are trimmed by hand from large blocks of graphite approximately 5 inches square, and

thirty inches long, several being required to make one electrode. The size of the electrode is dependent on the current it must carry. The cell diameter for the different current loads is the same, the cell being built higher for the heavier loads. Fifty-six cells may be set up in the cell room at once.

The electrolyte composition is 49% sodium chloride, and 51% calcium chloride. This mixture melts at 635°C. The melting point is checked daily, and composition is made up accordingly.

Much experimentation was done toward improvement of the process. Among others, were experiments with varying mixtures of salts, in an attempt to improve yields or operation. Ternary mixtures including, in addition to the sodium chloride, calcium and potassium chloride, calcium and barium chloride, and barium and potassium chloride. With these no improvement was shown. (No special attempt was made to gather experimental information, since the investigators were not specialists in the field, and the amount of material on hand for inspection was much too great to extract within a few days.)

Sodium.

During 1943 and 1944 between 600 and 700 metric tons per month were produced. Over the period November, 1942 to September, 1944, the lowest monthly production was 524 metric tons in April, 1944, and the highest, 703 metric tons in December, 1942. The sodium is generally produced in 4-kg. blocks, and packed in steel drums with pressure closure, which contain on the average 130 kg. Smaller size blocks are also made for some customers.

Besides shipments to the Scheideanstalt plants at Frankfurt and Rheinfelden, significant shipments were also made to Deutsche Hydrierwerke, Dessau, Gewerkschaft Deutschland in Weetzen, and to several IG plants, including the tetraethyl lead plant at Gapel. (See Appendix I for shipment data).

Certain files obtained indicated that the warehousing facilities for the sodium used at Gapel were at Niedersachswerfen, and that construction of a plant in Heydebreck (spelt Heidebreck in the files, but spelt with 'y' in Gazeteer and in shipping records) for manufacture of tetraethyl lead had been commenced in 1941. It was also inferred that work was being done on production of lead sodium direct without first producing metallic sodium. A plant had been completed at Frose, but was not in operation due to labor shortages.

Sodium is shipped to Rheinfelden for the manufacture of sodium peroxide.

Cost of the sodium metal per 100 kg. varied in 1943-44 from 60.47 RM (April, 1943) to 81.69 RM (September, 1944). These "costs" are actually higher than they normally would be calculated, since all of the electric power is charged to sodium production, and the chlorine considered as a by-product. The cost of the chlorine is therefore lower than it normally would be calculated.

Purification of the sodium is obtained by melting under nitrogen, heating to about 300°, and treating with sodium monoxide, then filtering.

The sodium is kept under an atmosphere of nitrogen (furnished by the neighboring plant of AG für Stickstoffdunger), up to the point where it is poured into the molds.

The filter residues, consisting of salts and sodium and calcium metal, are put into a sodium press, and filtered with hydraulic pressure, to obtain more sodium. Residues from this pressing contain approximately 20% sodium.

Analysis of the normal sodium production shows a purity of 99.82 to 99.93%, containing less than 0.1% calcium. Doubly purified samples gave an analysis of 99.995% sodium, and less than 0.001% calcium. (The "percent sodium" in these figures is evidently calculated by difference, as no analytical method is sufficiently accurate to obtain figures valid to the accuracy here expressed).

Chlorine.

From 1942 to 1944, between 900 and 1,000 tons of liquid chlorine and an average of 14 tons of gaseous chlorine were produced per month. The cost per hundred kg. in 1943 and 1944 varied between 4.93 RM (December, 1943) and 6.29 RM (July, 1943) for liquid chlorine, and 4.86 RM (January, 1943) and 6.47 RM (July, 1944) for gaseous chlorine. The prices are low due to the fact that the cost of the electricity has been figured totally into sodium cost, considering chlorine for this purpose as a by-product.

Besides its use in production of chlorinated oils, chlorinated rubber, and as a bleaching agent, this chlorine was shipped to Chemische Fabrik Wesseling, AG, for oxidation of prussian blue; to Marquart and to Norddeutsche Affinerie for cobalt recovery, and to Degussa's beryllium plant at Rheinfelden. It was also used in the gaseous form for manufacture of chlorinated lime in the Knapsack plant, and some gas was piped over to the AG für Stickstoffdünger who burned it with hydrogen from industrial gases to produce HCl for washing acetylene.

Since the heavy raid of last October, no more than one day's production of liquid chlorine was kept on hand. At the time of the visit no chlorine at all was on hand. The storage capacity consisted of 15 tanks, holding 27 tons each, and an emergency tank at a lower level protected by concrete walls and cover which was just recently installed, into which chlorine could be drained in an emergency, such as a raid.

Tank cars of heavy steel construction were used, having sides and top built to resemble a box car. Source of information said this was for insulation against sun's rays in the Summer. It could also have been for camouflage purposes, or to prevent espionage observation. Chlorine was also shipped in smaller pressure tanks.

The chlorine was removed from the cells by vacuum produced by pumps installed on the dry side of the collectors. Sulfuric acid was used to dry the chlorine. The pumps were lubricated with concentrated sulfuric acid, due to lack of available paraffin oil for lubrication. Liquification was accomplished in a 3-stage compressor, and run into the storage tanks, from which it was loaded into the tank cars.

Chloride of Lime.

A small plant utilizes some of the chlorine gas for the production of chloride of lime by reaction with lime. This plant averaged about 34 tons a month during 1943 and 1944. The principal customers in 1943 and 1944 were Julius Hoesch, AG für Chemische Industrie at Gelsenkirchen, and Schoeller at Düren.

"Glühsalz".

Heat-treating baths for metal treatment were produced in three grades - 430, 540, and 670. The numbers evidently refer to the melting point of the blend of salts. The blends were made by melting mixtures of the salts in a small electric furnace. These salts were sold packaged in cloth bags containing 90 kg. Production varied greatly, evidently according to the demand, averaging about 50 tons per month of each grade.

Formulae are taken from the cost figures:

Glühsalz 430

Calcium chloride	49%
Barium chloride	32%
Sodium chloride	19%

Glühsalz 540

Barium chloride	55%
Potassium chloride.	28%
Sodium chloride	17%

Glühsalz 670

Barium chloride 45%
Sodium chloride 55%

(These percentages, as taken from the cost figures, are not the same each month, but may vary a few percent. Evidently the exact composition is not highly important).

Miscellaneous Information.

Among the documents submitted for file with MIRS are two of interest from operational viewpoint. One is a voluminous yearly report for the year 1938, describing the activities of the plant for that year, and including several dozen graphs and tables relating to costs, divisions of costs, electrical uses and other facilities, chlorine liquification costs, and so on.

The other is a file containing general information, evidently used for ready reference on all questions concerning the plant. Included are: cell material composition, yields, energy balances, information on various types of graphite, results of several development experiments, short descriptions of equipment used in each step of the process, list of raw materials and other materials on hand, and contracts and agreements with other concerns. The main points of contracts with IG covering limitations on manufacture, use and price of sodium and chlorine are given, showing very tight cartel-type control of the plant. For instance, 1980 tons of sodium are to be delivered yearly to IG, with an option for 300 more; IG agrees not to make sodium for its own use, except as needs exceed this delivery. IG agrees further not to sell sodium to other parties, nor to use sodium forproduction of NaCN, sodium peroxide or other oxygen-containing salts. The Knapsack plant agrees not to produce sodium in other than Downs apparatus. The price of sodium to IG is set, with certain increases allowed proportional to increases in power and steam costs. etc.

Two small catalogs are included, one describing Degussa products produced in their various plants, and the other listing raw materials used in Degussa and subsidiary works.

The following documents were obtained, and have been turned over to MIRS for filing:-

1. Book, containing carbon copies of liquid chlorine daily production reports from 1 October, 1944 to 27 October, 1944.
2. Versand buch (shipping records - book January,1940 to November, 1941: book January, 1943 to February, 1944: book March, 1944 thru January, 1945).

3. Frachtenkonto (Freight records from September, 1942 to May, 1943).

4. Jahresbericht 1938. (Operation report for the year 1938).

5. Ground plan of AG für Stickstoffdünger Knapsack (two copies).

6. Natrium 202 Position. (Monthly statements on sodium and sodium peroxide for Degussa plants in various locations).

7. Natrium (Miscellaneous files on sodium, packaging etc.)

8. Ground plans of Degussa Knapsack plant, 1917, and (approximately) 1945).

9. Monthly cost records of Glüsalz 430 (heat-treating salt).

10. Glühsalz 540 - Monthly cost records.

11. Glühsalz 670 - " " "

12. Magnesia - " " "

13. $CaCl_2$-Schmelze - " " " (90% Mixture of $CaCl_2$ with salt).

14. Na Metall - " " " of sodium metal.

15. Chlorflüssig - " " " of liquid chlorine.

16. Chlorgas - " " " of gaseous chlorine.

17. Sammel-Konto Juni 1944 - (Overall accounting records for June, 1944).

18. Chlorflüssig, Chlorkalk Verkäufe - (Monthly sales records of liquid chlorine and bleach from 1940 to September, 1944). (Arranged according to accounts, not to shipping points).

19. Chlorflüssig (Miscellaneous files on liquid chlorine).

20. Aktennotiz Chlorflussig (Shipping and correspondence on liquid Cl_2).

21. Booklet - "Verzeichnis Sämtlicher Degussa-Erzeugnisse". (List of Degussa products).

22. Booklet - Rohstoffbedarf der Degussa (List of raw materials used by German and several other subsidiaries of Degussa).

23. File - General information on Knapsack plant: raw materials, warehouse-stores, rails, transport, pilot plant works, chlorine works, contract with IG, etc.

II. Report on Visit to Offices of Sachtleben, AG, Worthstr. 34, Cologne, Germany.

Location of Offices: Coordinates 461617, Sheet 5007, GSGS 4414.

These offices were visited 8 March, 1945, by Captain Paul Seydel, CWS, Hq, ETOUSA, and Major Shutt, CWS, 7th Corps, and again on 13 March by Captain Seydel. The offices are housed in a building of three stories and a basement, containing between 30 and 40 rooms. These are the head offices

of the company, and contain thousands of files relating to sales, purchases, correspondence, and costs of many chemical items. On the top floor two small laboratories are located, one a paint testing laboratory, and the other apparently just for general chemical purposes. None of the laboratory files were found. The building had been damaged to the extent of several large holes in the walls, and practically complete removal of window frames.

Almost all the files and papers were evidently still in the building. During several hours of searching, various documents of possible interest were found. Files of correspondence on the following subjects were noted:

Acardol	(Trade name)
Aetznatron	Caustic soda
Agfa Riechstoff	Agfa perfumes
Allgemeine Chemikalien	General chemicals
Aluminium chloride	
Amasil	(Trade name)
Ameisensäure	Formic acid
Antichlor	
Anilinölsalze	Aniline salts
Ammoniumformiate	
Antivibrin	(Trade name)
Asordin	(Trade name)
Barium carbonat	
Barythydrat	Barium hydrate
Betanaphthol	
Bisulfate	
Blanc Fixe	
Bleicherde	
Bleichanlage	
Cadmium Farben	Cadmium pigments
Chlorbarium	Barium chloride
Chlorflüssig	Liquid chlorine
Chlorat	Chlorates
Chlorcalcium	Calcium chloride
Chloroform	
Chlorzink	Zinc chloride
Chlormethyl/Aethyl	Methyl/ethylchloride
Chlorschwefel	Sulfuryl chloride
Chromoxyd	
Chromsalze	Chrome salts
Coumarin	
Dichloraethylen	
Eisenchlorid/chlorür	Ferric/ferrous chloride
Emailfarbkörper	Enamel colors

Erkalen	(Trade name)
Feuerkitt Hoechst	Hoechst fire
Feuerschutzmittel	Fire protective materials
Flotations chemikalien	Flotation chemicals
Fluoride	
Flour Produkte	Flourine products
Gipshärtegemisch	Plaster hardening mixture
Glykolsäure	Glycolic acid
Gummilösungsmittel	Rubbersolvents
IG Buntschwarzbrand	(Trade name)
Kaliumpermanganat	Potassium permanganate
Kieselgel	Silica gel
Kleesalz	
Leucht gelb	Phosphorescent yellow
Lupretin	(Trade name)
Methylenchlorid	
Mirbanöl	Mirbane oil
Monochlorbenzol	
Natriumbisulfit/sulfit	Sodium bisulfite/sulfite
Natriumsilikat	Sodium silicate
Nekal	(Trade name)
Nibren u. Vergusswachs	" "
Nivosol	" "
Nitrobenzol	Nitrobenzol
Nitronaphthalin	
Oxalsäure	Oxalic acid
o-Dichlorbenzol	
o-Toluidin	
p-Dichlorbenzol	
Phthalsäureanhydrid	Phthalic anhydride
Phonolith	(Trade name)
Phosphorsäure	Phosphoric acid
Phosphorsäuresalze	Phosphates
Pottasche	Potash
Roh Schwefelbarium	Raw barium sulfide
Salzsäure	Hydrochloric acid
Salicylsäure	Salicylic acid
Schaumlöschpulver	(Trade name)
Schwefelnatrium	Sodium sulfide
Siliron	(Trade name)
Siliron entharzer	(Trade name)
Tetrachlorkohlenstoff	Carbon tetrachloride
Titanweiss	Titanium white
Tonalon	(Trade name)
Tonerde	Clay
Trockeneis	Dry ice
Totogen	(Trade name)
Ultrasan	(Trade name)
Weisstrübungsmittel	
Zementschwarz/blau	Cement black/blue

Zinkweiss	Zinc white
Zinnsalz	Tin salts

Of these, the file of "General Chemicals" was taken for filing with CIOS. It includes correspondence on a number of pure chemicals, proprietary mixtures, plastics, synthetic rubbers, etc. produced by IG.

Another file found contained between four and five hundred copies of tabulations which were evidently shipments of chemicals through this office to various customers for the years 1942 and 1943. The file is principally of interest in showing the large variety of chemicals handled. Among other materials, are over 60 essential oils for perfumes produced by Agfa. Samples of forty of these were found in a box in the office.

The Oppanol files contain correspondence from October, 1937, when Oppanol B and C were first offered for sale, through 1941. Circular descriptions of the various products are included, lists of permitted deliveries, and various correspondence on deliveries of the different types and forms of Oppanol. The same type of correspondence is included in a file from 1937 thru 1940 on synthetic rubbers, Perbunan, Buna , and Igetex.

Invoice files for the month of July, 1943, were obtained to get general information on types of materials shipped, shippers, and customers. The greater part of the invoices are IG Farben's, which are listed under "Divisions A, A III, B, C, G, K, L (e), M, S, Z", and branches at Uerdingen and Leverkusen. Under Division S are also invoices of Kali-Chemie, AG, and of Duisberger Kupferhütte. Other plant invoices are of Chlorzink-Produkte G.m.b.H, Schwefel G.m.b.H, Verkaufsgesellschaft für Kunststoff-Erzeugnisse .m.b.H, Gesellschaft für Aufbereitung m.b.H, Fluorprodukte G.m.b.H, and Salzbergwerk Neu-Stassfurt. Among the products included are heavy chemicals, organic chemicals, Siliron, liquid chlorine (Division A III), dry ice, phosphorus, hypochlorites, light metals, inorganic salts, adhesives, iron oxide pigments, Membranit, preservatives, sulfur, plastics, fluorides, synthetic rubber materials, etc.

A file entitled "Verschiedene Chemikalien" (various chemicals) includes correspondence written during the 1930's, descriptive circulars, etc. on many different products handled by IG Farben.

Among the descriptive booklets and pamphlets are descriptions of silica gels, emulsifying waxes, alkyd resins, polyvinyl resins, Oppanol products, resin emulsions, materials for artificial leathers, fire protective materials, cementing

materials (for paper, rubber, metal, etc.), plastic wood, rust inhibitors, cleaning solvents, water glass, methyl-chloride (as refrigerant), bituminous emulsions, hypo-chlorites, Siliron (detergent), and color cards for iron oxide pigments and chromoxide green pigments.

The information found was merely of general interest. Nothing of chemical warfare interest was discovered.

The following documents were obtained, and have been turned over to MIRS for filing:-

1. File - Allgemeine Chemikalien (Miscellaneous information on misc. chemicals).
2. Files - Verschiedene Chemikalien (Misc. information on misc. chemicals). (Two files).
3. File - Oppanol (Files on Oppanol from 1937 to 1941).
4. File - Synth. Kautschuk, Buna, Igetex, Perbunan (Syn. rubber files).
5. File - Werksmeldungen (Reports on lithopone (?) by various plants).
6. Files - Rechnungen Juli 1943 (Invoices July, 1943).
7. Office address book.
8. File of transactions of miscellaneous chemicals for 1942 and 1943 for different plants.
9. File - Protokoll der Aufsichtsratsitzungen ab 1933. (Records of Board of Directors from 1933 to 1940).
10. Verzeichnis der Anlage (Plant catalog) Wolfach.
11. Unterlagen für die Aufsichtsratsitzung der Westfälische Zellstoff AG, Wildshausen. (Report on condition of plant, 1940).
12. Unterlagen für die Aufsichtsratsitzung der Westfa"-lische Zellstoff AG "Alphalint" Arnsberg (Report on condition of plant 1942).
13. Alphalint - Bericht für ---- 1943 (Monthly reports for June, July, August, September, October and November, 1943).
14. Selbstkosten, Monat April, 1944, Sachtleben, Werk Homberg (Cost figures - pigments).
15. Selbstkosten, Jahr 1940, Chemische Fabrik Marienhütte, G.m.b.H. Fürstenwalde (Spree) (Cost figures - pigments).
16. Selbstkosten, Jahr 1942, Werk: Wünschendorf a.E. (Cost figures - pigments).
17. Selbstkosten, Monat April, 1944, Sachtleben AG, Meggen (Cost figures - pyrites and barytes).
18. Die "Sachtleben" AG für Bergbau und Chemische Industrie Köln (reprint of a description of Sachtleben Co.)
19. "Sachtleben" Bericht über das 17. Geschäftsjahr vom Januar 1942 bis 31 Dezember, 1942 (3 copies of financial report for 1942).
20. "Sachtleben" Bericht über das 15. Geschäftsjahr (2 copies of financial statement for 1940).
21. AG für Lithoponefabrikation Wünschendorf/Elster,

Bericht über das Geschäftsjahr 1941 (Financial statement for 1941).

22. AG Für Chemische Industrie, Gelsenkirche-Schalke, Jahres-Bericht für das Geschäftsjahr 1940 (Financial statement for 1940).

23. Miscellaneous booklets describing IG products.

24. Buchführungs-Richtlinien mit Kontenrahmen der Wirtschaftsgruppe Chemische Industrie (Accounting Directive of the Management Group for Chemical Industry).

III. Report on Visit to Aktien/Gesellschaft für Stickstoffdünger Fabrik, Knapsack, Germany.

Location of Plant: Coordinates 372514, sheet 5107, GSGS 4414.

This plant was visited 9 March, 1945 by Captain Paul Seydel and Captain Joseph Seemiller. The plant was not in operation at the time, having stopped a few days before the arrival of American troops, but was preparing to recommence carbide production on a small scale as soon as water mains could be repaired. Most of the management personnel were still in the neighborhood, although a few had crossed the Rhine with the German troops. Among the latter was Dr. Poland, chief of the plant laboratory.

The personnel interviewed were:-

Direktor Maier, Manager of the plant.

Mr. Arnet, chemical engineer in charge of carbide works. (Norwegian, lived 30 years in Germany).

Dr. Hartmann, chemical engineer in charge of acetic acid production.

The production of this plant consists principally of calcium carbide, calcium cyanamide, acetic acid, acetaldehyde, acetone, acetic anhydride, and ferro-silicon.

Bomb damage to the plant was considerable during several raids. The most important raid, causing the heaviest damage was that of 28 October, 1944. During this raid, the aldehyde plant was hit, and badly damaged. A great deal of damage was suffered by buildings, and pipe lines during this raid. However, most of the machinery of the works is still in good condition. It was observed generally here and in other plants, that the impression of damage given by the first glance is much worse than the actual damage sustained, as far as operations are concerned. Unless machinery is directly hit, it can very often be put quickly back into operating condition, if cleaning up debris, and repairing pipe lines is completed.

Of the thirteen ovens for production of carbide, two only were left undamaged, and in operating condition. These two had a capacity of 50 metric tons per day each, as compared with a pre-raid capacity of 1,000 tons a day for the plant. In preparation for recommencing operations, sufficient electricity had been alloted to the plant from Rheinische Westfälische Elektrizitätswerke to run one oven. Production would presumably go into calcium cyanamide, to be used for fertilizer.

Three more ovens of somewhat larger capacity could be put into operation with a few days of repair work, and cleaning up of debris. This work had not yet been commenced at the time of the visit. There was an enormous amount of cleaning up to do around the works, and at the time, electricity for production of more than 50 tons per day was not available. 3,600 kilowatthours are required per ton of carbide.

Coke was obtained from any of the neighboring coke plants in the Saar or Ruhr districts. Lime for the carbide production had been obtained from the eastern Belgian border district. Lime used in this process was quicklime. Sufficient raw materials were on hand to run the carbide plant at its present capacity of 100 tons per day for two months.

The calcium carbide production was converted partially into granular form by sintering in rotary ovens at 1100°C. This is done principally for the production of calcium cyanamide in granular form, to prevent excessive dusting in handling. Cyanamide is produced both in rotary ovens and in tunnel ovens, (German: Kanalofen), in which cars holding several hundred kilos of carbide are pulled through an atmosphere of nitrogen.

The nitrogen used for the production of calcium cyanamide is produced in a special type of Linde air separation apparatus, which produces both nitrogen and oxygen in 99% purity. The oxygen is used in the production of aldehyde and acetic anhydride. 1200 cu.meters per hour of nitrogen can be produced, and 400 cubic meters of oxygen. Bottling capacity of only 300 cubic meters of gas a day is available, and is seldom used.

Acetylene gas is produced for the manufacture of further derivatives by the so-called "dry process", that is, just sufficient water is added to the carbide to produce a nearly dry lime on release of the gas. This lime isheated in a kiln to produce the quicklime, and used over again for the manufacture of carbide, on blending with regular stocks of raw lime. Not all of the gas is made by this

process. Low grade carbide is decomposed with excess of water, for according to Mr. Arnet the low grade material has a detrimental effect on the apparatus used for the dry process.

Hydrochloric acid is produced by burning chlorine gas piped over from the neighboring plant of the Degussa Knapsack works with hydrogen from industrial gases. This hydrochloric acid is used both for purification of the acetylene, and for washing of carbon residues from the carbide furnaces. These washed carbon residues have a very high activity, and are used for water purification.

Metallic mercury and iron oxide are used in the catalyst for the production of acetaldehyde. A large proportion of the aldehyde produced goes into the manufacture of synthetic rubber. From the aldehyde plant a pipe line runs to storage tanks on the Rhine, on the property of Chemische Fabrik Wesseling AG in Wesseling, who handles the loading of the aldehyde on to barges for shipment, to the IG plant at Hoechst, where further derivatives are prepared.

Most of the acetic acid and acetic anhydride that is produced is a mixture. Copper acetate and cobalt acetate are used as catalysts, in both continuous and batch processes. In the batch process no solvent is used, but in the continuous process a solvent of ethyl acetate is utilized to increase yields. The mixture of acid and anhydride so produced is separated in three fractionations. As a byproduct of the process, about 1-2% methyl acetate is produced, which comes off the distillation with the low-boiling fraction, and is then collected for a second purification in a batch still.

A small amount of acetic acid is produced directly from the acetaldehyde by use of 80% oxygen with a manganese catalyst.

Ferrosilicon is produced in two ovens, which are still in operating condition. The total capacity is 30 tons per day. Enough material is on hand to run the ferro-silicon furnaces for one month.

No repairs of any extent had been made in the plant since the air raids, due to shortage of materials and facilities, which were not available even for work of fairly high priority. This material shortage was so extensive that equipment was being shipped from low priority plants to those of high priority. On 26 October, 1944, two days before the big air raid, an acetone production tower had been removed and shipped to Schkopau. After the raid, when acetylene derivative

production was shut down, an acetic acid tower was also shipped to Schkopau.

These works were owned by IG Farbenindustrie. The laboratory was therefore not equipped to do research work, which is done principally in the main laboratories of the IG concern, where research facilities are centralized. Only a small amount of development work was done, principally on production of aldehyde and acetic anhydride. The laboratory head, having left for inner Germany, was not available for questioning. Personnel interviewed professed not to know much of the work of the laboratory, and time was not available for digging out the information.

IV. Report on Visit to the Rheinische Friedrich-Wilhelms-Universitat, Bonn, Germany.

Location of University: Main Buildings: Coordinates 55374, Sheet 5208, GSGS 4414. Chemical Institute: Coordinates 546366, same map.

The University was visited 11 March, 1945, by Captain Paul Seydel, CWS, Hq. ETOUSA. A short talk was had with a Frau Jung, a woman of some fifty years, who said she had been secretary to Professor Pfeiffer, the Dean of the department of mathematics and natural sciences.

According to Frau Jung, the University had been closed for about a month, after damage by air raid in the first part of the month of February (the date was not determined, as three different persons asked in the neighborhood of the building gave three different answers). Dr. P. Pfeiffer had left for Küstrin, but had probably come back farther west after the Russian advance. All the other professors had also gone across the Rhine farther into Germany at least several weeks before the arrival of the American troops.

No evidence of important war work was found in the files examined. However, certain decisions could not be made with regard to this without several weeks of careful reading. It is probable that files and notes concerning such matters and the more recent work being done would be taken with the professors when they moved.

Pfeiffer's main interest seemed to be the preparation of metallo-organic complexes, and complex chromone derivatives. Many samples of both types of derivatives were found in his office. A reprint of an article on research work on lubricant oil synthesis by the Fischer-Tropsch process was seen, which had evidently been done by one of Professor Pfeiffer's students. A letter written by Pfeiffer to a Dr. Epler on 30 December, 1942, states that he is doing no war research, but that Drs. Schmitz-Dumont (organic chemist) and von Antropoff (physical chemist) have undertaken some problems of military

importance. What this work consisted of could not be determined at the time.

Von Antropoff's interests lay in the field of rare gases. One letter found among his files discussed the possibilities of production of helium in Europe. It seemed, however, that no hope was given for a practical solution of the problem at the time.

A file of Government correspondence was found, indicating some of the subjects in which the Government was interested. Among these were: metal diffusion, thermal recovery of light metals, heterogenous catalysis, insecticides, neutrons, coal tar, etc. The file principally included announcements of meeting for discussion of these subjects, and no information of a valuable nature was found. The fields covered were too broad and general to form any conclusions.

The professors in the Chemical Institute included:

Prof. Dr. Paul Pfeiffer (organic chemist)
Prof. Dr. Andreas von Antropoff (physical chemist)
Prof. Dr. Walter Dithey (organic chemist)
Prof. Dr. Otoo Schmitz-Dumont (organic chemist)
Prof. Dr. Mark Freiherr von Stackelberg (physical chemist).

With regard to the bomb damage done to the university, only a small amount of damage was done to the chemical institute, apparently principally blast damage. The main buildings of the university, near the center of town, were completely destroyed.

Classes had been held and laboratory experiments carried out on identification and analysis of war gases as a part of the general scheme of gas defense work. No other evidence of work on war gases was found, nor was any special equipment such as special hoods and decontamination preparations seen.

The following documents were obtained and have been forwarded to MIRS for filing:

1. Bonner Universitäts Führer (guide to the University of Bonn).
2. Personal- und Vorlesungs-Verzeichnis 1943/44 (Catalog of personnel and lectures).
3. Personal- und Vorlesungs-Verzeichnis 1944/45.
4. File - "Reichsamt - (Correspondence with official agencies).
5. File - "Assistenten" - (Miscellaneous notes and correspondence about assistants).

6. Correspondence - Letter from Pfeiffer to Dr. Epler mentioning war work being done by Prof. v. Antropoff and Prof. Schmitz-Dumont.

7. Correspondence - to Prof. v. Antropoff in re possibility of production of helium in Europe.

8. Paper dated November, 1940 concerning scientific relations with USSR.

V. Report on Visit to Deutsche Gold- und Silberscheideanstalt, Werk August Wegelin, Kalscheuren, Germany.

Location of plant: Coordinates 425534, sheet 5107, GSGS 4414.

This plant was visited 10 March, 1945, by Capt. Paul Seydel, CWS, Hq. ETOUSA. Only one employee, a Herr Becker, could be found on the grounds. From him the names of Dr. Huppe, the director, and Dr. Haas, Produktionschef (manager, lived in Bruhl), were obtained. Becker stated that he believed these men were still around. Some of the plant workers were still around the neighborhood, although many had crossed the Rhine with the German troops. Becker did not know how many were still there.

This plant manufactures carbon blacks for rubber, for paper, cement, paints and other purposes. Included in its production is the CK-3 type carbon black, used for tires made with synthetic rubber.

The principal raw materials used are naphthalene and anthracene oils, and anthracene residues, obtained as by-products of coke production.

The plant had only superficial damage as far as production was concerned, and was in condition to go into operation immediately. enough oils were on hand for approximately ten days operation. Only about one ton of the carbon black was found, packaged in paper bags. The greater part of the plant was equipped for burning oil, but three furnaces, each approximately eight feet in diameter, were seen that were evidently used for burning solid material. Becker stated that the production of the plant was about ten to twelve tons per day. This figure checks with the calculated production based on the amounts of raw materials purchased and used.

Due to the fact that most of the plants in the neighborhood are shut down, and business in general is practically at a standstill, it is believed that it would be easy to find sufficient labor to recommence operation. The greatest difficulty would be in transportation of raw materials and finished products, since no rail transportation was available.

The following documents were obtained and have been forwarded to MIRS for filing:-

1. Lagerskontro der A. Wegelin, A.G., Buch II, 1-7-36 to 21-12-38 (Material records of August Wegelin).

VI. Report on Visit to Offices of C.F. Boehringer und Soehne, G.m.b.H., Lutticherstr. 34, Cologne, Germany.

Location of Office: Coordinates 437602, Sheet 5007, GSGS 4414.

These offices were visited on 10 March, 1945, by Capt. Paul Seydel, CWS, Hq. ETOUSA. The building had not been badly damaged, and most of the files seemed to be present. No personnel could be found.

About the only information available in these offices was with respect to orders, shipments, and deliveries. Several price lists of pharmaceuticals and drugs were found. Beyond showing what items were handled, the office was of no great interest.

The following documents were obtained and have been forwarded to MIRS for filing:-

1. B & S, August, 1937 through April, 1938 (File of correspondence with Mannheim-Waldhof plant of C.F. Boehringer).
2. File, B & S, January, 1942 through September, 1944, (correspondence with Mannheim-Waldhof plant of C.F.B.)
3. File, Kunden Bestellungen vom 1-8-1942 (Customers' orders from 1-8-42). (Two folders, A-J and K-Z).
4. File, I.G. Farbenindustrie vom 29-12-34, (correspondence with IG from 29-12-34 to 29-4-43).
5. 7 price lists of pharmaceuticals, including MBK, Boehringer, Lyssia-werke, and Atmos-Ges.

VII. Report on Visit to Westdorp und Wehner, Otto Fischerstr. 29, Cologne, Germany.

Location of plant: Coordinates 439590, Sheet 5007, GSGS 4414.

This plant was visited 12 March, 1945, by Captain Paul Seydel, CWS, Hq. ETOUSA. The plant had been badly damaged by bombs, and all papers and most of the equipment had been removed. One room was found containing several thousand cardboard boxes of various types of photographic plates having labels of both Westdorp and Wehner, and Dr. C. Schleussner Fotowerke, G.m.b.H., Frankfort aM.

The building itself was about 50 to 80 feet, three stories, with one basement story, set back nearly a hundred feet from the street. The building which stood in front of it had been

reduced to a pile of bricks, so that it was not possible to tell if it had also been a part of the plant or not.

As far as could be ascertained from the furniture left, the plant had manufactured principally glass photographic plates. The main room for this was in the basement. Sinks, tables and drying racks were in several other rooms, but there was no direct evidence of their purpose, other than for general photographic work. Some cans for movie film were stacked in one room in the basement, but there was no evidence of facilities for production of such film.

Final decision on the production of this plant will have to wait until personnel can be found. In any event it is seen that the production is not very large, judging from the size of the plant.

PAUL V. SEYDEL,
Captain, CWS.

26 March, 1945.

APPENDIX I.

SALES OF SODIUM DEUTSCHE GOLD UND SILBERSCHEIDE ANSTALT-KNAPSACKWERKE ("DEGUSSA") IN METRIC TONS PER MONTH. (LARGEST CUSTOMERS).

	1943 MAR	APR.	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1944 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
Degussa																					
Frankfurt	262	237	153	106	229	169	251	47	108	264	172		79		210	119	231	251	39	14	
Rheinfelden	77	158	159	136	88	11	75	100	234	103		292	257	282	47	104	52	169	126		
Hiagwerk Schleiden															59	78	63				
Trondfurt										36											
Deutsche Hydrierwerke																					
Dessau	168	80	130	155	145	178	183	134	146	61	224	196	134	160	151	143	114	132	108	143	
Rosslau	12	12							6			27									
Rodlebeu			24							113	36	25							45		
I.G.																					
Leverkusen	9	6	6	5	5	9	8	6	3	5	18	6	6	6	6	6	12				
Frose	36	36																			
Wuppertal	5			5		10			10		10	5	5				5	10			6
Frankfurt		6		6																	
Ludwigshafen				38			4											12			
Elberfeld		5																			
Gapel			36	24																	
Heidebreck																		36	14	97	
Doebertiz						12										12					
Wissenschafliche																					
Forschungen (W.70)																					
Niedersachswerfer	84	73	49	108	134	110	36	112			140			24		18					
Nordhausen																					
Räthen								117							14	25					
Ebrach									25												
Eicheloh				30							27										
Munchen													57	48							
Gera													27								
Dynamit A.G.																					
Troisdorf	4	4	12	6		13	6				6	6	6	6	6	14		6	8		1
Hannover	5	8					8					8	8	8							
Empelde									8		8				8	8			8		
E. Merck																					
Darmstadt	2	3			4			3	4		4		4		4		3				
Heeresgasschutzlaboratier																					
Berlin								2		3	1										
Kühne & Nagel																					
Fredelar																			115	12	
Gewerkschaft "Deutschland".																					
Weetzen																			74	115	
Schaefer & Schael																					
Breslau																			10	10	
Kali Chemie																					
Römenberg																				58	
TOTAL PRODUCTION..	722	655	710	637	621	558	624	576	615	643	661	573	652	542	612	638	645	638	572	482	9